

being described in the DEIS/R so the public can comment meaningfully about the proposed action, its impacts, and proposed mitigation measures and alternatives.

As a result of this missing information, the decisionmakers and the public do not have sufficient information to evaluate whether the proposed action's environmental effects will be avoided or minimized.

In conclusion, as specifically identified above, there are several areas in the DEIS/R where there is a serious paucity of information essential to completing a thorough environmental review of the Cabrillo Port LNG action. It is on this basis that we seek a suspension of time under the Deepwater Port Act. Please direct your response to Linda Krop, Chief Counsel of the Environmental Defense Center, 906 Garden Street, Santa Barbara, CA, 93101 (805-963-1622).

Sincerely,

Linda Krop, Chief Counsel
Environmental Defense Center

Joel Reynolds, Senior Attorney
Natural Resources Defense Council

Susan Jordan, Executive Director
California Coastal Protection Network

Carl Zichella, Regional Staff Director
Sierra Club

Bill Powers, Director
Border Power Plant Working Group

Mark Rauscher, Environmental Director
Surfrider Foundation

Craig Shuman, Staff Scientist
Heal the Bay

Tracy J. Egoscue, Executive Director
Santa Monica Baykeeper

Damon Wing, Programs Director
Ventura Coastkeeper

Peter Galvin, Conservation Director
Center for Biological Diversity

Ileene Anderson, S. California Regional Botanist
California Native Plant Society

Greg Helms, Program Manager
Ocean Conservancy

Rory Cox
Pacific Environment

Jonathan Parfrey
Physicians for Social Responsibility-LA

Linda Sheehan, Executive Director
California Coastkeeper Alliance

Serge Dedina
Wildcoast, Executive Director
California Baja Coastkeeper, Project Director

Bruce Reznik, Executive Director
San Diego Baykeeper

Chris Pesenti, Co-Director
Pro Peninsula

Don May
California Earthcorps

Ozzie Silna
Malibu Coastal Land Conservancy

Gordon LeBedz
Surfrider Foundation, Long Beach Chapter

Bry Myown, Spokesperson
Long Beach Citizens for Utility Reform

Shirley Godwin, Chair
Saviors Road Design Team

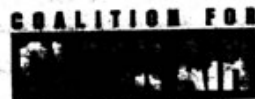
Tim and Hayden Riley
TimRileyLaw.com

Kraig Hill
Malibu, CA

cc: Senator Dianne Feinstein
Senator Barbara Boxer
Representative Lois Capps
Representative Elton Gallegly
Norman Y. Mineta, Secretary of Transportation
Tom Ridge, Secretary of Homeland Security
Governor Arnold Schwarzenegger
Lt. Governor Cruz Bustamante
State Controller Steve Westly
Senate Pro Tem Don Perata
Assembly Speaker Fabian Nunez
Senator Tom McClintock
Senator Sheila Kuehl
Assemblymember Pedro Nava
Assemblymember Fran Pavley
Tom Campbell, Director of Finance
Cabinet Secretary Terry Tamminen, Office of the Governor
Secretary Mike Chrisman, Resources Agency
Joe Desmond, Deputy Secretary of Energy, Resources Agency
Drew Bohan, Assistant Secretary for Policy, Cal EPA
Shannon Eddy, Renewable Energy and Energy Efficiency Advisor, CPUC
Mark Prescott, US Coast Guard
Ken Kusano, US Coast Guard
Cy Oggins, California State Lands Commission
Alison Dettmer, California Coastal Commission

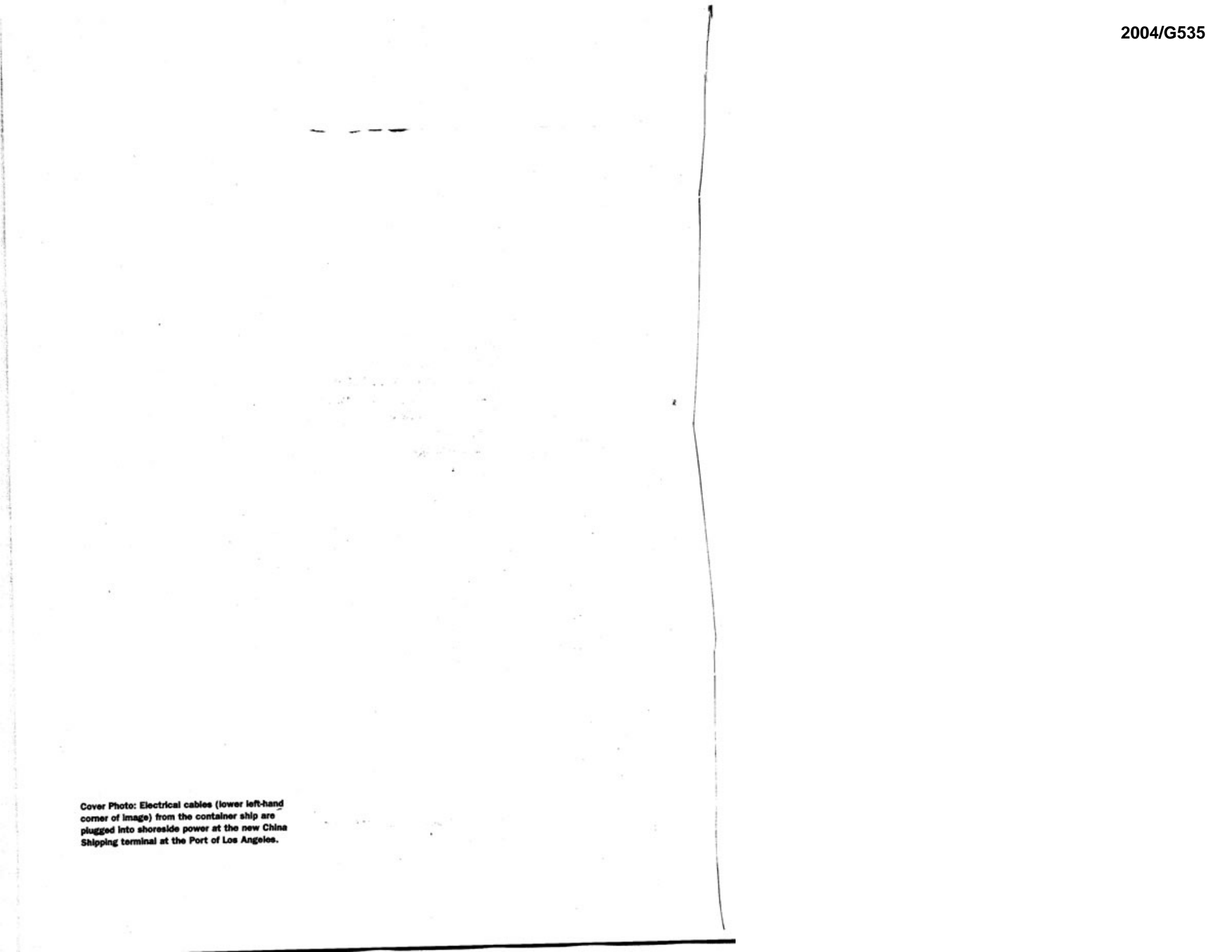
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Thank you for submitting the report.



Cover Photo: Electrical cables (lower left-hand corner of image) from the container ship are plugged into shoreside power at the new China Shipping terminal at the Port of Los Angeles.



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Authors

Diane Bailey

Thomas Plenys

Gina M. Solomon, M.D., M.P.H.

Todd R. Campbell, M.E.M., M.P.P.

Gail Ruderman Feuer

Julie Masters

Bella Tonkonogy

NATURAL RESOURCES DEFENSE COUNCIL

August 2004



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ABOUT NRDC

The Natural Resources Defense Council is a national, nonprofit environmental organization with more than 1 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, and San Francisco. Visit us on the World Wide Web at www.nrdc.org or contact us at 40 West 20th Street, New York, NY 10011, 212-727-2700.

ABOUT THE COALITION FOR CLEAN AIR

The Coalition for Clean Air is a nonprofit organization dedicated to restoring clean healthful air to California by advocating responsible public health policy, providing technical and educational expertise, and promoting broad-based community involvement. The Coalition for Clean Air has offices in Los Angeles and Sacramento, CA. For more information about the coalition's work, visit www.coalitionforcleanair.org or contact us at 523 West 6th Street, 10th Floor, Los Angeles, CA 90014, 213-630-1192.

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<i>NRDC Reports Manager</i>	<i>NRDC President</i>	<i>CCA President</i>
Alexandra Kennaugh	John Adams	Tim Carmichael
<i>Editor</i>	<i>NRDC Executive Director</i>	<i>CCA Vice President</i>
Matthew Freeman	Frances Beinecke	Janine Hamner
<i>Production</i>	<i>NRDC Director of</i>	<i>CCA Outreach and</i>
Bonnie Greenfield	<i>Communications</i>	<i>Communications Manager</i>
	Alan Metrick	Nidia Bautista

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Appendices

The appendices are available only on NRDC's website at

<http://www.nrdc.org/air/pollution/ports/contents.asp>

and at the Coalition for Clean Air website at

<http://www.coalitionforcleanair.org/portreports>.

Appendix A: Port Land-Use Efficiency Methodology

Appendix B: Additional Technical Information for Mitigation Measures

Appendix C: Model Aquatic Resources Protection Program for Shipping Ports

Appendix D: International Rules and Treaties

The Dirty Truth About U.S. Ports

Environmental report cards for ports in 10 U.S. cities, issued by NRDC

and the Coalition for Clean Air in March 2004, are also available online at

<http://www.nrdc.org/air/pollution/ports/contents.asp> and

<http://www.coalitionforcleanair.org/portreports>.



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ABBREVIATIONS

AAPA	American Association of Port Authorities
AFS	antifouling system
AMP	Alternative Maritime Power
BACT	best achievable control technology
BFO	bunker fuel oil
BMP	best management practice
CARB	California Air Resources Board
CNG	compressed natural gas
CO	carbon monoxide
CO ₂	carbon dioxide
DOC	diesel oxidation catalyst
DNA	deoxyribonucleic acid (genetic material)
DPF	diesel particulate filter
EEZ	exclusive economic zone
EGR	exhaust gas recirculation
EMS	environmental management system
EPA	(U.S.) Environmental Protection Agency
EU	European Union
FTF	flow through filter
HFO	heavy fuel oil
HP	horsepower
IMO	International Maritime Organization
ISO	International Organization for Standardization
LNC	lean NO _x catalyst
LNG	liquefied natural gas
LPG	liquefied petroleum gas (propane)
LSD	low-sulfur diesel
MDO	marine diesel oil
MECA	Manufacturers of Emission Controls Association
MGO	marine gas oil
MOU	memorandum of understanding
MSRC	Mobile Source Air Pollution Reduction Review Committee
MTO	marine terminal operator
NDZ	no discharge zone
NG	natural gas
NO ₂	nitrogen dioxide
NO _x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PM	particulate matter
PM ₁₀	particulate matter less than or equal to 10 microns in size
RTG	rubber-tired gantry crane

SCAQMD	South Coast Air Quality Management District
SCR	selective catalytic reduction
SECAT	Sacramento Emergency Clean Air Transportation (program)
SO ₂	sulfur dioxide
SO _x	sulfur oxides
SWPPP	Stormwater Pollution Prevention Plan
TBT	tributyltin
TERP	Texas Emission Reduction Program
TMDL	total maximum daily load
VOCs	volatile organic compounds (similar to hydrocarbons and reactive organic gases, as some regulatory agencies commonly use)
g/bhp-hr	grams per brake horsepower-hour (a measure of the amount of a pollutant per engine energy output)
g/kWh	grams per kilowatt hour (a measure of the amount of a pollutant per unit energy output)
lb/MW-hr	pound per megawatt hour (a measure of the amount of a pollutant per unit energy output)
ppm	parts per million
tpd	tons per day



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EXECUTIVE SUMMARY

Marine ports in the United States are major hubs of economic activity and major sources of pollution. Enormous ships with engines running on the dirtiest fuel available, thousands of diesel truck visits per day, mile-long diesel locomotives hauling cargo and other polluting equipment, and activities at marine ports cause an array of environmental impacts that can seriously affect local communities and the environment. These impacts range from increased risk of illness, such as respiratory disease or cancer, to increases in regional smog, degradation of water quality, and the blight of local communities and public lands.

Most major ports in the United States are undergoing expansions to accommodate even greater cargo volumes. The growth of international trade has resulted in corresponding rapid growth in the amount of goods being shipped by sea. Despite the enormous growth within the marine shipping sector, most pollution prevention efforts at the local, state, and federal level have focused on other pollution sources, while the environmental impacts of ports have grown.

Marine ports are now among the most poorly regulated sources of pollution in the United States. The result is that most U.S. ports are heavy polluters, releasing largely unchecked quantities of health-endangering air and water pollution, causing noise and light pollution that disrupts nearby communities, and harming marine habitats.

In March 2004, NRDC and CCA issued report cards for the 10 largest U.S. ports on their efforts to control pollution—or lack of efforts to control pollution. In the short time since the grades were issued, steps to reduce port pollution have already been made. For example, the first container ship in the world plugged into shoreside power at the Port of Los Angeles. This report discusses solutions to port pollution problems and provides additional information on the health and environmental impacts of port operations; an overview of policies governing U.S. marine ports; and detailed analysis and technical recommendations to port operators, regulatory agencies, and community-based environmental and health advocates.

AIR POLLUTION AND HEALTH IMPACTS FROM PORT OPERATIONS

The diesel engines at ports, which power ships, trucks, trains, and cargo-handling equipment, create vast amounts of air pollution that affect the health of workers and people living in nearby communities and contribute significantly to regional air pollution. More than 30 human epidemiological studies have found that diesel exhaust increases cancer risks, and a 2000 California study found that diesel exhaust is responsible for 70 percent of the cancer risk from air pollution.¹ More recent studies have linked diesel exhaust with asthma.² Major air pollutants from diesel engines at ports that can affect human health include particulate matter (PM), volatile organic compounds (VOCs), nitrogen oxides (NO_x), and sulfur oxides (SO_x).

The health effects of pollution from ports may include asthma, other respiratory diseases, cardiovascular disease, lung cancer, and premature death. In children, these pollutants have been linked with asthma and bronchitis, and high levels of the pollutants have been associated with increases in school absenteeism and emergency room visits. In fact, numerous studies have shown that children living near busy

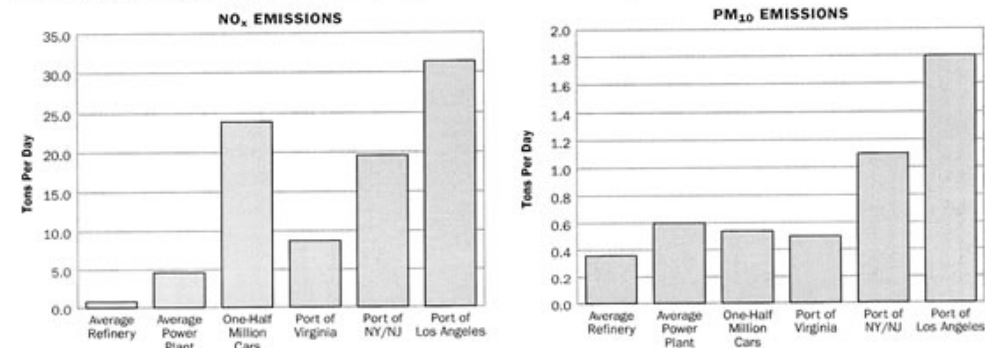
diesel trucking routes are more likely to suffer from decreased lung function, wheezing, bronchitis, and allergies.^{3,4,5}

Many major ports operate virtually next door to residential neighborhoods, schools, and playgrounds. Due to close proximity to ports, nearby communities face extraordinarily high health risks from associated air pollution. Many of these areas are low-income communities of color, a fact that raises environmental justice concerns.

Although cars, power plants, and refineries are all large and well-known sources of pollution, Figure E-1 demonstrates that the air pollution from ports rivals or exceeds these sources. In the Los Angeles area, oceangoing ships, harbor tugs, and commercial boats such as passenger ferries emit many times more smog-forming pollutants than all power plants in the Southern California region combined.⁶ And the latest growth forecasts predicting trade to approximately triple by 2025 in the Los Angeles region mean that smog-forming emissions and diesel particulate pollution could severely increase in an area already burdened by the worst air quality in the nation. The larger contribution of port sources to air pollution can be attributed to the fact that pollution from cars, power plants, and refineries is somewhat controlled, whereas port pollution has continued to grow with almost no regulatory control.

Figure E-1 uses the Port of Los Angeles and the Port of New York and New Jersey as examples because they are the largest ports on the West Coast and East Coast, respectively. The Port of Virginia is comparable in size to other large ports such as Savannah, Houston, and Seattle. Figure E-1 also highlights emissions of NO_x and PM, because these pollutants are associated with very severe health impacts.⁷ Despite very conservative assumptions used to calculate port emissions, ports out-pollute some of the largest sources of harmful emissions, raising the question, Should ports be regulated like other large sources of pollution?

FIGURE E-1
Nitrogen Oxides (NO_x) and Particulate Matter (PM₁₀) Pollution from Ports Compared to Refineries, Power Plants, and Cars



Sources: Seaports of the Americas, American Association of Port Authorities Directory (2002); 127. U.S. EPA, National Emission Trends, Average Annual Emissions, All Criteria Pollutants, 1970-2001, August 13, 2003. Energy Information Administration, Petroleum Supply Annual 1982, Volume 1, DOE/EIA-0340(82)/1 (June 1983, Washington, DC), pp. 97-103 and Petroleum Supply Annual 2000, Volume 1, DOE/EIA-0340(2000)/1 (Washington, DC, June 2001). Table 40, Energy Information Administration, Form EIA-861, "Annual Electric Utility Report." As posted at www.eia.doe.gov/cneaf/electricity/public/t01p01.txt. U.S. Dept of Transportation, Federal Highway Administration, 2000 Highway Statistics, State Motor-Vehicle Registrations.

WATER POLLUTION FROM PORT OPERATIONS

Port operations can cause significant damage to water quality—and subsequently to marine life and ecosystems, as well as human health. These effects may include bacterial and viral contamination of commercial fish and shellfish, depletion of oxygen in water, and bioaccumulation of certain toxins in fish.⁸ Major water quality concerns at ports include wastewater and leaking of toxic substances from ships, stormwater runoff, and dredging.

LAND USE PROBLEMS AT PORTS

The highly industrialized operations at ports are often in close proximity to residential areas, creating nuisances and hazards for nearby communities. Ports have several available options to avoid developing new terminals near residential areas. They can develop property previously used in an industrial capacity, or they can increase efficiency of land use at existing terminals. The land use patterns at U.S. ports suggest much room for efficiency improvements. Of the 10 largest U.S. ports, even those that are most efficient in terms of land use—Long Beach and Houston—are four times less efficient than the Port of Singapore, a model of land use efficiency.

PORT COMMUNITY RELATIONS

Ports can be bad neighbors. In addition to the air and water pollution they create, they can cause traffic jams and can be loud, ugly, and brightly lit at night. These impacts range from simple annoyances to serious negative health effects. For example, noise pollution has been linked to hearing impairment, hypertension (high blood pressure), sleep deprivation, reduced performance, and even aggressive behavior.⁹ At ports bordering residential neighborhoods, bright lights at night and the flashing lights of straddle carriers and forklifts can affect nearby residents, disrupting biological rhythms and causing stress and irritation.^{10,11}

Ports can also be bad neighbors by ignoring residents of the communities living next door, or making little or no effort to solicit community input into operational decisions that will directly affect the life of the community and its residents. Many U.S. ports have developed decidedly hostile relations with their neighbors, not only because of the pollution the ports produce but also because they have consistently ignored residents of nearby communities, refusing sometimes even to share critical information about possible effects of port operations.

RECOMMENDATIONS

The fact-finding for this report revealed untenable situations in many communities near ports: freeways and neighborhood streets overloaded with trucks, homes coated with soot, soaring asthma rates, containers stacked high enough to create significant neighborhood blight, piles of dredged sludge forming toxic islands, and prime marine animal habitats gouged by channeling. The following are recommendations

to port operators and policymakers on how to clean up port operations. The recommendations, and the problems they seek to address, are described in greater detail throughout the report.

Recommendations for Ports

Ports must commit to protect local communities and the environment, not only during expansions but also during regular operations. Following are suggested measures used by select ports worldwide to successfully decrease impacts on local communities and ecosystems. These measures should be employed at all container ports to clean up their operations, and local activists should be aware of these options to advocate for their implementation. Ports should consider the negotiation of new or modified leases as an important opportunity to require a combination of the mitigation measures, such as the use of cleaner fuels and equipment.

Marine vessels

- ▶ Clean up harbor craft, such as tugboats, through engine repower and retrofit programs.
- ▶ Limit idling of oceangoing vessels and tugboats by providing electric power at docks and requiring ships and tugboats to “plug in” to shoreside power while at berth.
- ▶ Require ships, including oceangoing vessels, to use the cleanest grade of diesel fuel possible, with a sulfur content of 15 to 2,000 parts per million.
- ▶ Where possible, create incentives for, or otherwise promote the use of, emission controls on oceangoing vessels.

Cargo-handling equipment

- ▶ Retire equipment that is ten or more years old and replace it with the cleanest available equipment and fuel choices, preferably alternative fuels.
- ▶ Retrofit existing equipment less than ten years old to run on the best available control technology, including diesel particulate filters (DPFs) with lean NO_x catalysts (LNCs) and, if not feasible, with diesel oxidation catalysts (DOCs).
- ▶ Switch to cleaner diesel fuels, such as low-sulfur fuel with sulfur content less than 15 parts per million and diesel emulsions.

On-road trucks

- ▶ Create incentive programs that encourage fleet modernization, the retirement of older trucks, and their replacement with modern lower-emitting trucks.
- ▶ Offer incentives for the installation of pollution controls, including DPFs with LNCs or, if not feasible, with DOCs.
- ▶ Make cleaner fuels, such as diesel emulsions or low-sulfur diesel, available to off-site trucks.
- ▶ Minimize truck idling by enforcing idling limits or by installing idle shutoff controls.

Locomotives

- ▶ Repower or replace all switching locomotives that do not meet the Environmental Protection Agency (EPA) Tier 0 Standards with electric-hybrid or alternative-fuel engines.
- ▶ Install engine emissions controls where possible.

- Require automatic engine shutoff controls to minimize unnecessary idling.
- Commit to using cleaner fuels, such as on-road grade diesel.

Stormwater management

- Take principal responsibility, as the general permittee, for preparing a stormwater pollution prevention plan for all terminals.
- Provide guidance to all port tenants for development of model stormwater programs, oversight and inspections of individual terminals to confirm implementation of an acceptable program, and education and training of terminal staff.
- Carefully document and analyze potential water pollution problems, water quality monitoring, and best management practices for the prevention, control, and treatment of stormwater runoff.

Other measures recommended include water quality programs; traffic mitigation; land use, light, and noise abatement; improved aesthetics; and other terminal design features.

Recommendations for Policymakers

In addition to the mitigation measures ports should implement on their own, a number of policy and regulatory actions are needed to protect human health and the environment from the large, industrial, and high-polluting operations at marine ports. Ordinarily, such activities would be subject to stringent regulation, but oversight of ports falls between the regulatory cracks, defeated by confusion over jurisdictional authority and the ongoing efforts of a strong industry lobby. While a patchwork of international, federal, state, and local rules apply to various pollution sources at ports, most are weak and poorly enforced.

Marine vessels

- The U.S. government should officially ratify MARPOL Annexes IV and VI (an international treaty that prevents sewage pollution and sets emissions standards for ships) and the Antifouling Systems Convention, which bans toxic chemical coatings on ship hulls.
- The EPA should expedite efforts to establish the entire East, West, and Gulf coasts as control zones subject to stricter emission standards under MARPOL VI.
- The EPA should implement a graduated harbor fee system similar to a program in Sweden that requires more polluting ships to pay higher fees upon entering a port.
- The EPA should expedite implementation of stricter emission standards for all marine vessels within two years.
- States and regional authorities should create financial incentives for the cleanup and replacement of older marine vessels.
- States and regional authorities should require ships to plug in to shoreside power while docked.
- States should require that ships use low-sulfur diesel while in coastal waters and at berth (until electric power is made available). In the absence of state action, regional authorities should require this.
- Regional authorities should monitor and enforce ship speed limits.

On-road and nonroad vehicles

- ▶ The EPA must follow through with full implementation of its 2007 emissions standards for on-road, heavy-duty trucks; its 2008 emissions standards for nonroad vehicles and equipment; and the related lower sulfur diesel requirements.
- ▶ The EPA should adopt a series of diesel retrofit rules, similar to those proposed in the California risk reduction program, to establish a cleanup schedule for existing polluting diesel engines. In the absence of federal action, states or local authorities should adopt these programs.
- ▶ The EPA should set uniform federal idling limits for all diesel engines. In the absence of federal action, states or local authorities should require idling limits.
- ▶ States should provide incentive programs to reduce pollution from heavy-duty diesel engines, similar to programs such as California's Carl Moyer and Gateway Cities; in the absence of state action, regional authorities should sponsor such programs.
- ▶ Regional authorities should adopt fleet rules to clean up and require new, cleaner purchases of all heavy-duty engines, similar to those in place in the Los Angeles area.

Inland cargo transport

- ▶ The EPA and individual states should consider fees on each container entering a port to provide funding for mitigation of the environmental impacts of moving those containers.
- ▶ The U.S. government should adopt and support a sustainable transportation system program, similar to the European Union program, facilitating the shift of cargo transport from more polluting modes (such as trucking) to cleaner locomotive and barge transport.

Locomotives

- ▶ The EPA should implement stricter emission standards for locomotives within one year.
- ▶ States and regional authorities should also create financial incentives for the cleanup and replacement of older locomotives.
- ▶ States should negotiate memorandums of understanding that create incentives for cleaner locomotives. In the absence of state action, regional authorities should pursue this.

Land use

- ▶ Regional authorities should improve efforts to protect marine habitats from further infill due to port developments.
- ▶ Regional authorities should work together with local communities and marine terminals to improve efficiency and land use and to minimize impacts of terminals on local communities.

Community relations

- ▶ Neighboring states should work together in coastal alliances to protect their marine natural resources and to share information on programs and technologies, and they

should work together to jointly shoulder the neglected responsibility to neighboring communities and their surrounding environment.

Stormwater

- ▶ The EPA should issue effluent guidelines to require a general baseline level of pollutant reduction for port facilities, or for those pollutants typically found in port runoff.
- ▶ States should ensure that anti-degradation provisions of federal and state law are fully implemented in stormwater permits.
- ▶ States should give special attention to the development of total maximum daily loads (TMDLs) for impaired waters around many ports.
- ▶ Local governments should prioritize port facilities when designing inspection protocols in conjunction with local regulatory programs and implementation of municipal stormwater permits.

Oil spills

- ▶ Congress should pass the Stop Oil Spills Act (H.R. 880) to accelerate the phase-in of double-hulled tankers in U.S. waters by 2007.
- ▶ Regional authorities should require ports to take steps to ensure that oil pollution does not become part of runoff and that portwide oil-recycling programs are in place.

Ballast water

- ▶ The U.S. Coast Guard should finalize mandatory national ballast water regulations as quickly as possible, or no later than the expected summer 2004 completion date.
- ▶ States should adopt ballast water regulations, similar to those in place in California and Washington, that ensure a 200-mile buffer from the U.S. coast.

Waste discharge

- ▶ The EPA must consider more stringent requirements on the dumping of wastes containing oxygen-depleting nitrogen and phosphorous, as well as persistent toxic compounds that continue to threaten marine life.

CONCLUSION

Based on our previous survey of 10 of the largest container ports in the United States, not nearly enough is being done to alleviate the severe impacts of the highly polluting shipping industry despite real and significant environmental and health impacts associated with marine port operations. Ports should take internal measures to reduce pollution caused by port activities. Likewise, regulatory agencies at the federal, state, and local level must provide long overdue safeguards. Further, if port expansions are to continue, all projects must be mitigated to the maximum extent possible, efficiency must be improved, and current operations should be cleaned up.

CHAPTER 1

HEALTH AND ENVIRONMENTAL EFFECTS OF PORT POLLUTION

The economic benefits of marine ports are typically accompanied by significant environmental and public health problems. Hundreds of enormous diesel-powered ships, millions of diesel trucks, and other polluting equipment and activities at modern seaports cause an array of environmental degradations that, when uncontrolled, can severely affect the health and quality of life of residential communities, as well as marine and land-based wildlife throughout a region. Among the environmental harm caused by pollution from marine ports are a significant increase in regional smog, contamination of nearby bodies of water, introduction of destructive invasive species, increased cancer and other health risks for nearby residents, and blight on local communities and public lands.

The specific sources of these various environmental hazards from marine ports are many. They include:

- ▶ Car and truck traffic, including thousands of diesel trucks servicing each of the major ports every day
- ▶ Rail and commercial ship traffic
- ▶ Cargo-handling equipment
- ▶ Chemical storage and handling
- ▶ Fueling of ships, trucks, trains, and cargo-handling equipment
- ▶ Liquid discharges from ships
- ▶ Painting and paint stripping
- ▶ Ship breaking (dismantling)
- ▶ Maintenance and repair of roads, rails, grounds, vessels, vehicles, and equipment
- ▶ Channel dredging¹

Even though marine ports are often associated with heavy industrial activities, they are usually situated in or very near residential communities or environmentally sensitive estuaries. A variety of negative environmental consequences commonly result, including



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- ▶ Air pollution from port operations and construction activities, including smog and toxic particulate pollution
- ▶ Loss or degradation of wetlands; destruction of fisheries
- ▶ Loss of habitat of local endangered species
- ▶ Contamination from wastewater and stormwater discharges
- ▶ Severe traffic congestion
- ▶ Noise and light pollution
- ▶ Loss of cultural resources
- ▶ Contamination of soil and water from leaking storage tanks and pipelines
- ▶ Air releases from chemical storage
- ▶ Solid and hazardous waste generation and soil runoff and erosion²

Cargo is moved around shipyards by fleets of highly polluting heavy-duty equipment, and it is delivered and taken away from those shipyards by millions of heavy-duty container trucks and locomotives, many of which were built well before emission standards were even considered.

MARINE PORTS ARE MAJOR SOURCES OF AIR POLLUTION

Many of the dirtiest sources of air pollution are concentrated at marine ports, often creating a veil of brown haze that carries with it all of the severe health effects of industrial and urban air pollution. For example, marine ports attract hundreds of enormous oceangoing ships and tugboats, which burn the dirtiest grade of diesel fuel available. Cargo is moved around shipyards by fleets of highly polluting heavy-duty equipment, and it is delivered and taken away from those shipyards by millions of heavy-duty container trucks and locomotives, many of which were built well before emission standards were even considered. These and other port-related sources combine to rival the worst pollution from power plants and refineries, accounting for large percentages of the statewide air pollution in major shipping states.

Air pollutants emitted from port-related activities adversely affect the health of port workers, as well as residents of nearby communities, and contribute significantly to regional air pollution problems. The major air pollutants related to port activities that can affect human health include nitrogen oxides (NO_x), sulfur oxides (SO_x), ozone (O₃), particulate matter (PM), diesel exhaust, and volatile organic compounds (VOCs). Other pollutants from port operations—such as carbon monoxide (CO), formaldehyde, heavy metals, dioxins, and even pesticides used to fumigate produce—can also be problematic.

Health Effects from Diesel Exhaust

The vast majority of equipment employed at ports today runs on diesel fuel, emitting a toxic brew of particles, vapors, and gases, including NO_x, VOCs, and SO_x.³ In addition to the pollutants just listed, diesel exhaust contains an estimated total of 450 different compounds, about 40 of which are listed by the California Environmental Protection Agency as toxic air contaminants with negative effects on health and the environment.⁴

Airway Irritation and Allergies from Diesel Exhaust Many studies have shown that diesel exhaust can irritate the nose, sinuses, throat, and eyes and damage the lower airways. Studies of people exposed to diesel exhaust have documented eye and nose

irritation, bronchitis, cough and phlegm, wheezing, and deterioration in the ability to take full, deep breaths.^{5,6} New important scientific evidence suggests that diesel exhaust may help to cause the initiation of allergies and worsen existing allergies.^{7,8} Exposure to diesel exhaust also causes elevated levels of immune cells in the airways, indicating that the body senses a hazardous substance.⁹

Increased Cancer Risk from Diesel Exhaust More than 30 human epidemiological studies have found that diesel exhaust increases cancer risk. One major study examined the effects of diesel exhaust exposure on more than 56,000 railroad workers over a 22-year period.¹⁰ Calculations based on this study showed that chronic exposure to just one microgram per cubic meter of diesel exhaust particles—roughly the level found in many suburban areas far distant from trucking routes or ports—would result in an additional risk of 1.3 to 15 cancer cases per 10,000 exposed individuals. Using that finding as a benchmark, the South Coast Air Quality Management District in California calculated that fully 71 percent of the cancer risk due to air pollution in the South Coast Air Basin is attributable to diesel particulate pollution. Agencies in a number of other areas have reached similar conclusions.¹¹

Dozens of studies have shown that long-term exposure to diesel exhaust significantly increases the risk of lung cancer.¹² In fact, workers exposed to diesel exhaust over the long term generally face an increase in lung cancer risks of between 50 and 300 percent.¹³ Studies have also reported links between diesel exposure and other cancers, including cancer of the bladder, kidney, stomach, blood (including multiple myeloma, leukemia, Hodgkin's disease, and non-Hodgkin's lymphoma), the oral cavity, pharynx, and larynx.¹⁴ A number of federal and international agencies have listed diesel exhaust as a probable or likely lung carcinogen, and in 1990, the state of California listed diesel exhaust as a known cause of lung cancer.¹⁵

Respiratory Illnesses Aggravated by Diesel Particulate Matter Particulate matter (PM) pollution ranges from the coarse dust kicked up from dirt roads to the very tiny sooty particles formed when wood, gasoline, or diesel are burned. At ports, construction and daily operations often create coarse PM, but it is the tiniest PM that causes the greatest health hazards. Much of this "fine" PM—so small that it is invisible to the eye—comes from diesel engine exhaust. Less than 1/20th the diameter of a human hair, fine PM can travel deep into the lungs, landing in the delicate air sacs where oxygen exchange normally occurs.¹⁶ Numerous studies have found that these fine particles impair lung function, aggravate such respiratory illnesses as bronchitis and emphysema, and are associated with premature deaths.¹⁷

Dozens of studies link airborne fine particle concentrations to increased hospital admissions for asthma attacks, chronic obstructive lung disease, pneumonia, and heart disease, including an increased risk of heart attacks.¹⁸ School absenteeism due to respiratory symptoms has also been linked to PM pollution.¹⁹ Among chronic health conditions, the leading reason for absenteeism from school is

Among chronic health conditions, the leading reason for absenteeism from school is asthma. Not surprisingly, PM pollution is associated with the increased prevalence of the condition in children.